

Draft

**Burke-Gilman Trail
Redevelopment Study**

Prepared for:

King County Facilities Management Division
Department of Executive Services

And

King County Department of Parks and Recreation

Prepared by



October, 2005

CONTENTS

List of Figures	ii
Acknowledgements	iii
Introduction	1
Part I	
Background of Project	3
Purpose of Redevelopment Study	3
Regulations and Standards.....	6
History	6
Site Assessment	7
Right-of-Way Survey and Title Analysis	9
Environmental Considerations	
Geotechnical	11
Topography	11
Geology	11
Landslide Area	12
Seismic Hazard Area	12
Stormwater	12
Wetlands	13
Streams	15
Wildlife	15
Vegetation	16
Built Environment Considerations	
Land Use	17
Traffic	17
Utilities	20
Public Participation	21
Part II	
Recommendations	22
King County alternative trail sections	22
AASHTO minimum trail section	24
Applying the recommended trail dimension	25
Examples of constraints and alignment adaption	25
Proposed signage	26
Trail surface	26
Trail crossings	27
Bridges	27
Street intersections and driveway crossings	27
Conclusion	31
Bibliography	33
List of Appendices	34

List of Figures

Figure 1. Location Map	4
Figure 2. Study Area Map	5
Figure 3. KC Alternative 1.....	22
Figure 4. KC Alternative 2.....	23
Figure 5. KC Alternative 3.....	23
Figure 6. AASHTO Minimum Width	24
Figure 7. Recommended Section	24
Figure 8. Widening to upland (west).....	25
Figure 9. Widening to lakeside (east).....	26

Note: Appendix 8 contains illustrations of trail crossing recommendations

Acknowledgements

The following individuals were members of the Citizen Action Group (CAG) that met with design team members, King County staff, subconsultants, and representatives of the Lake Forest Park City Council to review redevelopment opportunities and constraints along the roughly two mile section of the Burke-Gilman Trail that is the subject of this study. Their commitment and contributions are greatly appreciated.

Trailside homeowners:

Tim Ahern
Tom French
Dean Peterson
Stuart Strand

Cyclists:

Gary Elmer
Mark Withers

Other trail users:

Mark Gibbons
Alison Starling

Business representative:

Jeff Weissman

Community members at large:

Kate Comtois
Jon Skamser
Sandy Koppenol

Ex-officio, non-voting Lake Forest Park City Council Member

Ed Sterner

Lake Forest Park Parks and Recreation Commission member:

Michelle LeMoine

Burke-Gilman Trail Redevelopment Study

Introduction

The portion of the Burke-Gilman Trail that passes through roughly two miles of Lake Forest Park, from N.E. 145th Street to Log Boom Park, is the subject of this study. Created along a former railroad right-of-way, the trail has seen over 30 years of use and in that time the community it serves has grown from primarily local residents to a wide range of recreational users as well as bicycle commuters. In the same time frame the surface of the trail has deteriorated; encroaching vegetation has reduced the width in places; drainage ditches have become potential hazards; trees, shrubs, and fences block the view of crossing vehicular traffic; and trail etiquette has deteriorated. Trailside homeowners have expressed concern about the dangers of crossing the trail with its high volume of traffic, cyclists have voiced concern about the number of Stop signs at private driveways, and pedestrians have complained about the continuing conflicts with inconsiderate cyclists, pet waste, and lack of maintenance.

Given the atmosphere of community dissatisfaction and general degradation of trail conditions, community leaders came together to initiate rehabilitation and redevelopment of this heavily used segment in January 2000. Staff from several departments of the City of Lake Forest Park met with King County staff to discuss elements of a program for redesigning and upgrading the trail. In May of that year city officials held a public meeting to identify stakeholders, solicit community input on trail issues, and establish a process for redesign implementation. Stakeholders included the City of Lake Forest Park, King County, local residents, business owners, trail neighbors, and trail users.

In May 2002 representatives from King County met with those from the City of Lake Forest Park and stakeholder/user groups to formalize and begin discussing a program for trail redevelopment. In that same year King County retained a private consulting firm, Atelier PS, to establish a program for trail repairs and improvements with a maximum construction value of \$200,000. The draft report was completed and presented to county staff, but was not considered adequate because proposed recommendations failed to meet the County's long term vision for regional trails.

The project was rescoped in June of 2003 with an emphasis on making the trail meet current King County goals. An aerial mapping and topographic survey was initiated. The Atelier team was retained to again assess potential opportunities and constraints for redevelopment. At a public meeting at Brookside Elementary School in October 2003, King County staff collected and recorded public comments and concerns so that an improved trail would not only meet the public agency's objectives but would also meet community needs and national safety standards. A traffic study was initiated in the fall of 2003.

In the spring of 2004 the Lake Forest Park City Council became involved when Ordinance 907 was introduced. This required the use of non-impervious materials on trails in wetland and stream corridor buffers. It also proposed to require a conditional use permit for multiuse trails that would require a separation of uses and would not allow at-grade crossings at public streets and private driveways unless there were no practicable alternatives. It was later divided into two separate ordinances. As 907 it related only to pavement materials used in wetland and stream corridor buffers. The mayor issued a veto of 907 but the City Council voted to override his veto.

Ordinance 909 was created separately to address separation of uses and at-grade crossing issues. At the time of this writing, further consideration of that ordinance has been tabled. As a result of the City Council imposing restrictions on redevelopment of this section of King County trail, in September of 2004 a Memorandum of Understanding was approved between King County and the City of Lake Forest Park with regard to establishing a redevelopment study that is the subject of this report. The project was rescoped again to include wetlands investigations, a right-of-way survey, a wildlife study, geotechnical report, and additional studies as considered necessary. (See list of appendices.)

Based on the Memorandum of Understanding, a Citizen Advisory Group (CAG) of 13 members (chosen from 33 applicants) was established in November 2004 and included trailside homeowners, cyclists, a business representative, a Lake Forest Park Parks and Recreation Commissioner, and a variety of other trail users. Early in 2005 this committee met for the first time and over the next several months, under the direction of King County Parks staff, heard from technical subconsultants with regard to the studies listed above. Over the next several months the design team presented conceptual trail crossing plans and trail-widening alternatives. At its June 2005 meeting, after much discussion, the CAG voted to create a non-voting, ex-officio seat within the CAG to be filled by a member of the Lake Forest Park City Council. This was considered important to create a stronger line of communication with the City Council and to promote joint decision making and information sharing.

The CAG committee has reviewed all material researched and presented and will make recommendations to staff at King County Department of Parks and Recreation on trail design, safety, maintenance, and environmental concerns for the trail section that runs through the City of Lake Forest Park.

Burke-Gilman Trail Redevelopment Study Part I

Background of Project

In its entirety the Burke-Gilman Trail is a 27-mile urban biking and hiking trail heavily used by residents of Bothell, Kenmore, Lake Forest Park, Seattle, and suburban King County. Part of the County's Urban Trail Plan, this regional shared-use system connects Lake Sammamish in Redmond with Puget Sound in Seattle. Following the Sammamish River from roughly N.E. 170th Street in Bothell at the north end of Lake Sammamish to Log Boom Park (formerly Tracy Owen Station) at the north end of Lake Washington, the trail then follows the Lake Washington shoreline in a north-south direction to the University of Washington, and continues west through Seattle along the Lake Washington Ship Canal to Ballard. At the time of this writing it is being extended through densely urban neighborhoods in Ballard along former railroad right-of-way to a terminus at Golden Gardens.

The Burke-Gilman Trail was initially developed jointly by King County and the City of Seattle along an 11-mile right-of-way from Log Boom Park in Kenmore to the University of Washington in Seattle during the mid-late 1970s. (See Figure 1, Vicinity Map) Right-of-way acquisition from the Burlington Northern Railroad and trail development were made possible largely through funding from the region's 1968 Forward Thrust bond issue, Community Development Block Grants, and Federal Gas Tax Revenue (FAUS) funds.

This report assesses existing conditions and makes recommendations for just over two miles of the trail within the City of Lake Forest Park. (See Figure 2, Site Map.) The trail right-of-way extends 25 feet on either side of the original rail right-of-way centerline that generally parallels both State Route 522 and the western shoreline of Lake Washington. In the southern segment of the study area is a 100-foot wide segment of trail right-of-way. The trail lies within 200 feet of the edge of Lake Washington from N.E. 145th to N.E. 168th Street for about one mile, and veers away to about 800 feet from the lake edge for about ½ mile then back to within 200 feet of the water's edge for the last ¾ mile. This study section of trail was designed by the King County Department of Community and Environmental Development in 1975 and built in 1977. It's 10-foot width was considered innovative and forward looking at the time of its completion.

Current uses range from bicycling and walking to bird-watching, in-line skating, skateboards, dog walking, and jogging. Regional population growth has significantly increased trail use since its construction 30 years ago, especially by cyclists for both commuting and recreation. While cyclists make up approximately 75 percent of trail users in the County, in the Lake Forest Park segment of the trail that number is closer to 80 percent.

Purpose of the Redevelopment Study

The Lake Forest Park section is the oldest length of the Burke-Gilman Trail under King County's authority. Initial development in the 1970s preceded barrier-free accessibility standards, environmental resource legislation, and federal aid policies for bicycle facilities. In 2004 the County released new ***Regional Trail Inventory and Implementation Guidelines***, intended to create a system of trails that serve a wide variety of users. This publication addresses shared-use policies, appropriate trail surfaces, access control measures, street and driveway crossings, maintenance, and accessibility compliance. It also presents three alternative cross sections. It is the County's intent to upgrade the Lake Forest Park segment of the Burke-Gilman Trail to the conditions recommended in this document.

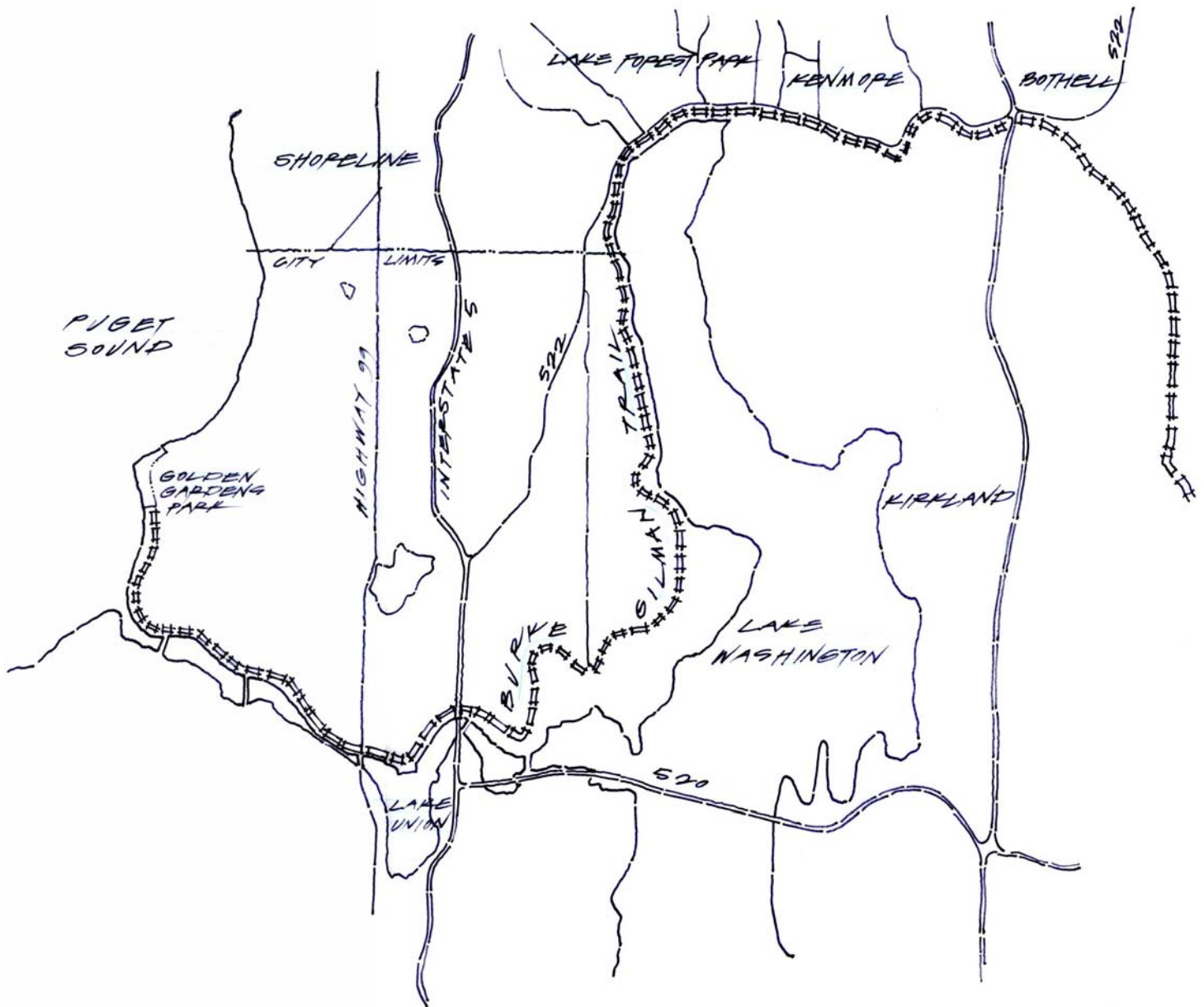


Figure 1. Vicinity Map

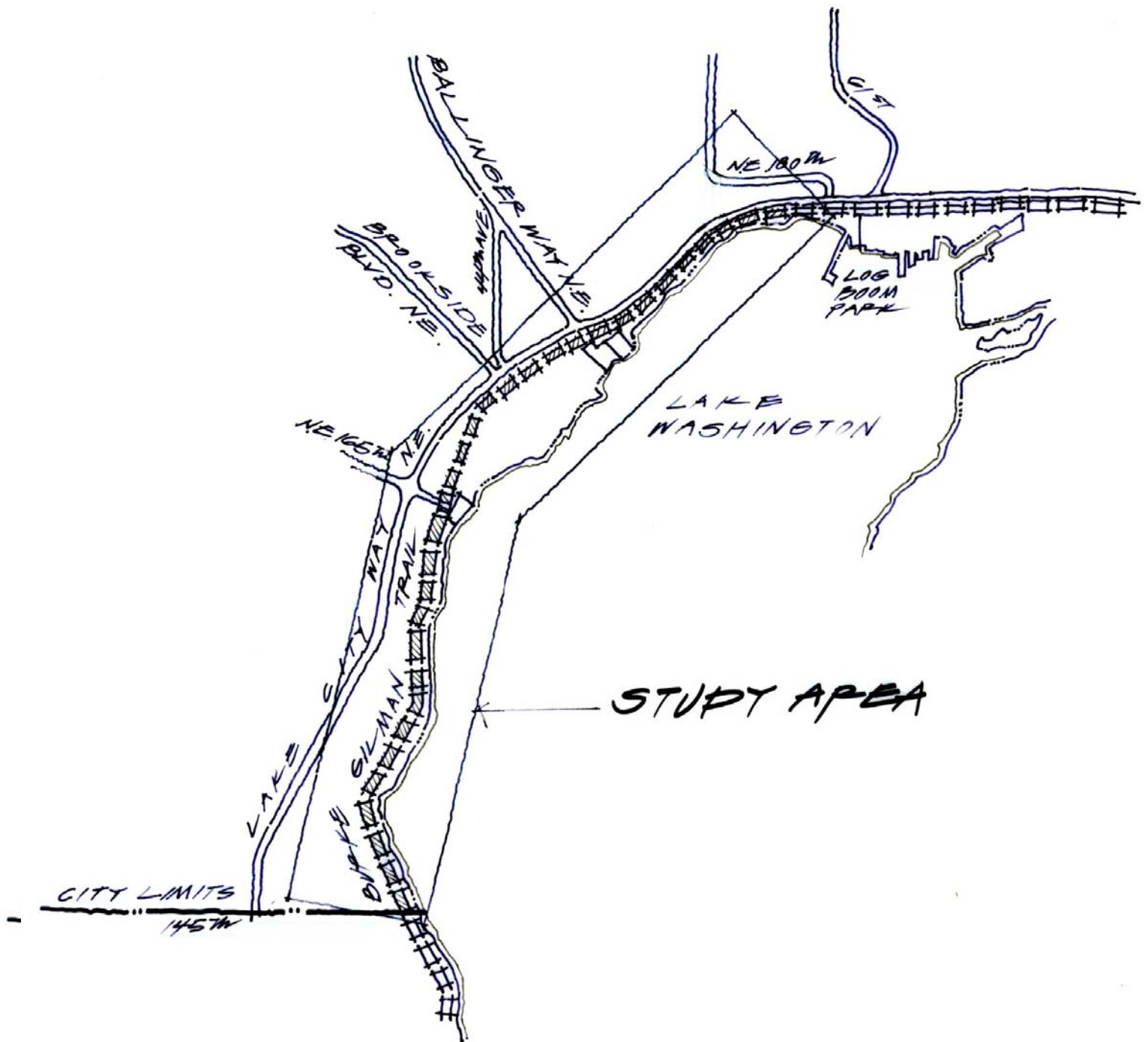


Figure 2. Study Area Map

Regulations and Standards

In 1991 the Federal Highway Administration (FHWA) issued a Federal Aid Policy Guide (FAPG 23 CFR 652) that established design and construction criteria for projects receiving Federal funds that aid bicycle and pedestrian projects. The American Association of State Highway and Transportation Officials' "*Guide for the Development of New Bicycle Facilities, 1999*" (known as the AASHTO Guide) or equivalent State or local guides now typically serve as the standard for construction and design of bicycle routes. Criteria defined in the revised AASHTO Guide (1999) provide the basis of the Bicycle Facilities section of the Washington State Department of Transportation (WSDOT) Design Manual.

In addition to the AASHTO Guide and WSDOT Design Manual, redevelopment of the Burke-Gilman Trail will be governed by other federal, state and local requirements. Applicable codes and legislation will likely include:

- Americans with Disabilities Act Guidelines (ADAAG)
- King County Surface Water Design Manual
- Lake Forest Park Municipal Code
- State Environmental Policy Act (SEPA)
- National Environmental Policy Act (NEPA)
- Washington Department of Fish and Wildlife Hydraulic Project Approval (HPA)

History

In 1886 Judge Thomas Burke and Mr. D. H. Gilman, in an attempt to provide rail service to the then undeveloped north end of Lake Washington, sought land donations for right-of-way. They purchased the corridor from the original owners via right-of-way, quitclaim, and warranty deeds. By 1887 work began and in April 1888, 40 miles of the Seattle, Lakeshore and Eastern Railroad Company (SLERC) was completed. The tract was later acquired by the Northern Pacific Railroad, called the Sumas Branch Line, and was used to move freight. Commuter service never developed as cars soon became widely used by lakeside residents who subsequently moved into homes on logged-off slopes above the lake.

Coal was one of the most important commodities hauled on the railroad, used to fuel the University of Washington Power Plant. When the power plant boilers were converted to gas, traffic ceased and the railroad, with permission from the Interstate Commerce Commission, abandoned service on the section of track near I-5 on the Lake Washington ship canal in January of 1972.

In 1973 a Citizen's Advisory Committee made a proposal to develop the abandoned tracks for steam excursion trains. The Seattle Railroad Historical Association proposed to operate trains over existing tracks between Sand Point and Kenmore with a stop at Lake Forest Park and with streetcar connections from Sand Point to University Village. Concurrently, the Puget Sound Excursion Line proposed to operate a connecting steamboat service from Sand Point to Kenmore, using the Steamer "Virginia V".

At the same time advocates for a recreational use trail proposed removing the railroad tracks and converting the linear segment to a pedestrian/bicycle trail. As a result of popular support, the Urban Trails Plan was adopted as an addendum to the King County Comprehensive Plan. It secured development of the trail right-of-way for use by bicyclists and hikers as part of a 51-mile chain of trails acquired on the perimeter of Lake Washington.

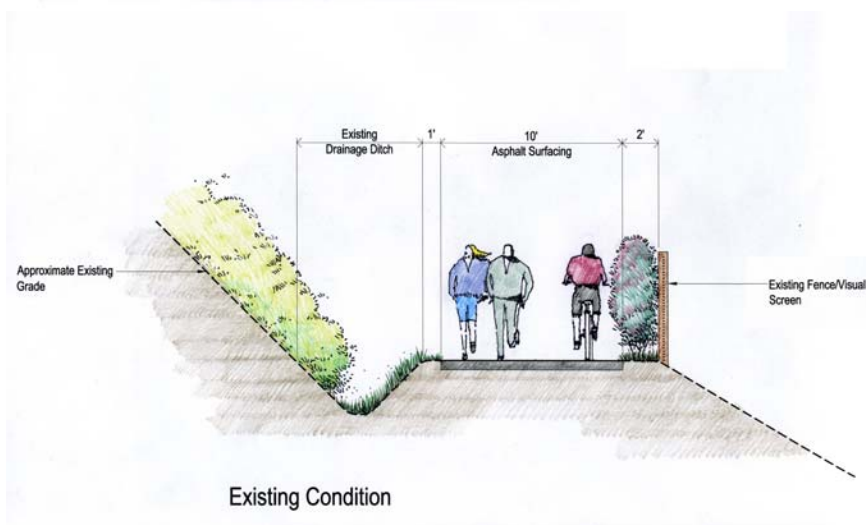
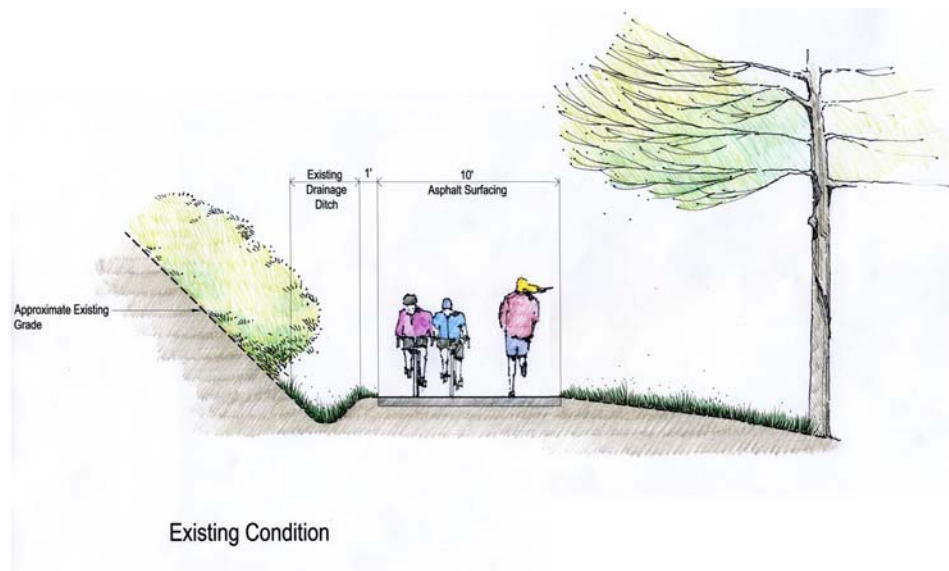
King County purchased all property rights in the project area formerly belonging to Burlington Northern Railroad via a quitclaim deed in 1974. Fee ownership, or ownership in fee, is common, outright ownership. Burlington Northern owned the project area in fee and the railroad's interest in the corridor was not subject to being extinguished on abandonment of the rail line. King County retains ownership of the property in fee, which is outright ownership. The County has the option of using any part of the corridor for the trail, subject to land use and environmental regulations.

During the 1980s and 1990s the trail was extended through Seattle as additional sections of trail right-of-way became available. During this time regional population grew and trail use increased as well. From a corridor that served primarily local recreational users to one that served regional commuter bicyclists as an alternative route to and from the Seattle area, the Burke-Gilman Trail experienced an increase in use. However, because of budget constraints King County was unable to adequately maintain the trail and problems arose with irregularities in the pavement, overgrown vegetation, signage, intersection crossing safety, parking on the trail, and over time, the fact that the trail didn't meet current county or national multi-use standards.

Site Assessment

The trail right-of-way in this study area runs north/south along an east-facing slope above Lake Washington in a primarily residential setting. It is characterized by a 15- to 20-foot wide graded bench (former rail bed) with cut and embankment slopes between 2h:1v (horizontal:vertical) and 3h:1v for most of its length. Side slopes vary in location and extent, generally rising to the west and dropping toward the lake to the east. The longitudinal gradient of the bench and paved trail is less than two percent.

The trail pavement currently consists of a 10-foot wide asphalted surface, typically with a grass shoulder on one or both sides. The trail was initially designed with a one-foot margin on either side as well as a shoulder, the width of which varies from less than a foot to more than eight feet. In general the shoulder slopes away from the pavement. In many places the ground on the upland (west side) slopes steeply into a drainage ditch, sometimes less than a foot from the edge of pavement. (See illustration below.) Some sections of the drainage ditch are as deep as two to four feet below the surface of the trail. At the trail's initial creation in the mid 70s King County erected chain link fences along the eastern edge of the right-of-way at varying distances from the 12-inch margin as a means of providing security and privacy for trailside property owners. In many places these fences were built up to private driveway edges and a number of homeowners have since added gates to these fences at their crossings.



Trail users encounter two signalized intersections in the northern part of the study area, at N.E. 170th and at Ballinger Way N.E.

In the same area two bridges are crossed. The original McAleer Creek bridge was replaced in 1996/1997 with a 12-foot wide steel span after the widening of Bothell Way N.E. North of McAleer Creek the trail parallels Lyon Creek for a distance of about 400 feet and crosses the stream channel on the original eight-foot wide wooden railroad bridge.

In general the west side of the trail has a fairly steep slope gradient and residential development is not highly visible as houses are at a higher elevation than the trail bench. To the east, single-family residences lower than the trail's elevation line most of its length. A local access road, Edgewater Lane, forms the eastern edge in the southern end of the study area and another, Beach Drive N.E., forms an edge along much of the middle and northern sections. Where these roads don't serve residences, private driveways cross the trail. Trail crossings at these points are generally of differing widths with differing gradients. Few have markings to warn drivers and/or

trail users of cross traffic. For both homeowners and trail users visibility is often limited by impeding vegetation and fences.

Turf encroachment at trail edges has reduced asphalt width in some places to between 9 and 9½ feet. The pavement surface is irregular, with signs of settlement, cracking, and root heave. Invasive weeds as well as overgrown trees and shrubs predominate along much of the upland side of the trail.

Above ground utility structures are physical obstacles to pedestrian/bicycle movement at the two signalized intersections (N.E. 170th Street and Ballinger Way N.E.). These include traffic light poles, light poles, and electrical boxes. At these intersections insufficient queuing space for trail users creates crowded conditions during times of heavy use and crowd trail users with bus commuters. Along the trail fire hydrants, electrical boxes, sewer manholes, water valves, and other utility structures are present in the trail right-of-way.

Site furnishings along the two-mile study area consist of: 1) a restroom and picnic tables at Log Boom Park; 2) one bench, a drinking fountain, and two picnic tables in the vicinity near Ballinger Way; and 3) two benches in an open clearing (within a zone of 100 foot right-of-way) on the lake side of the trail between N.E. 147th and N.E. 151st Streets. Slats in the chain-link fence along the top of the slope block views of the lake from this clearing. The lack of public restrooms south of Log Boom Park is an inconvenience for trail users. Few benches and trash receptacles exist in the study area.

Right-of-Way Survey and Title Analysis

Licensed land surveyors completed a trail right-of-way survey in February 2005. The purpose of the survey was to mathematically reconstruct the centerline and original right-of-way limits of the original rail line (SLERC) from Seattle city limits (N.E. 145th Street) to Kenmore based on location of the tracks as constructed circa 1887/88. The deeds granting the railway right-of-way “fix” that right-of-way as being a specified width “on each side of the centerline of the railway track as located across said lands” in 1887/88. Subsequent additions and exceptions to the original right-of-way are graphically indicated on the right-of-way survey based on supporting documents referenced in a title report prepared by the Pacific Northwest Title Company. (See Appendix 1.)

In 1895 the SLERC conveyed its western division to the Seattle and International Railway Company (SIRC) by deed in 1895 and in 1901 SIRC conveyed its entire property to the Northern Pacific Railway Company. The Northern Pacific Railway Company became the Burlington Northern in 1970 and the Burlington Northern Santa Fe (BNSF) in 1995. BNSF conveyed its interest in the southerly portion of the subject route in fee to King County in 1974 and the northerly portion in 1985.

The original SLERC “Right-of-Way and Track Map” (no date) served as the basis for the trail right-of-way reconstruction. The subject map graphically depicts the proposed railway route as a 50-foot wide strip (the southerly one-quarter mile is 100 feet wide) and is believed to predate the railway construction based on the absence (on the map) of any graphic depiction of platted (developed) properties adjoining the subject right-of-way.

Such platting of the large land parcels abutting the railway did not begin until the early 1890s when Statehood (1889) provided a mechanism for recording. The creation of the Montlake Cut in 1916 lowered Lake Washington by nine feet, creating marketable property on the east side of the

railroad line. Subsequent platting of large land parcels adjoining the railroad would eventually encompass virtually every property along both sides of the right-of-way.

The initial “Right-of-Way and Track Map” provided only two approximate distance ties from government land office (GLO) corners to the centerline of the subject right-of-way. As a result, the best available evidence of the subject trail right-of-way was determined to be the location of the railway tracks as they existed prior to their removal in the early 1970s.

Record survey documents (maps and field notes) from King County, the City of Seattle Engineering Departments, and private surveys (including those with mathematical ties from street monuments to the centerline of the railway tracks) were used to recreate the track centerline. Metro sewer maps from the 1960s and 1980s provided additional information regarding centerline location.

Random survey control monuments established in the 1960s by Horton Dennis and Associates for use in building the Metro Kenmore-to Matthews Beach Park sewer project were recovered during this recent survey. While these monuments have no direct relationship to the railway right-of-way, the survey field notes pertaining to them provided valuable and frequent ties to the existing railway tracks.

The mathematically recreated railway centerline completed in the 2004 survey compared favorably with recorded plats and recorded surveys of private properties adjoining the railway right-of-way. The degree of variance was, in most cases, less than the width of a penny and a maximum of two inches at only one location.

There are two special exceptions to the trail right-of-way: one just north of N.E. 147th Street and one just south of N.E. 151st Street. The former is on the east side, within the 100-foot trail right-of-way section and reduces the width to approximately 60 feet for a distance of roughly 175 feet.

The second exception is south of N.E. 151st Street and exists on both sides the trail. One property owner has a lakeside lot for a home and a west side easement for a stairway that accesses a garage that also has an exception in the trail right-of-way. For a distance of about 75 feet along the lakeside lot the trail’s right-of-way width is about 30 feet. The location of the garage exception reduces the width to 38 feet for a distance of 20 feet.

In addition, Edgewater Lane N.E. south of N.E. 147th is within an easement and a private road crossing near N.E. 155th Street also has an easement. Several other easements exist for utilities.

Encroachments and Non-Permitted Uses

Over a period of years the railroad issued indefinite term leases to private property owners along the railroad right-of-way for various undertakings, such as building driveways, creating parking spaces, and planting gardens within the right-of-way. When the trail changed hands from BNSF to King County those leases became obsolete and had to be negotiated with the County. Special Use Permits for any private use within the trail right-of-way have been and continue to be required by King County. Although several homeowners obtained these permits in the past, most have expired. It is the intent of the County to work with current property owners to secure permits for these non-permitted uses. However, the County reserves the right to require removal of any structures should they adversely impact trail redevelopment.

Environmental Considerations

Subconsultants from six disciplines reviewed existing conditions in the trail right-of-way beginning in 2005. The intent of this undertaking was to ensure that redevelopment would be based on a solid understanding of the physical setting. Trail redesign would have to take into account underlying geologic and hydrologic conditions. Environmental considerations are subject to regulation by the Municipal Code of the City of Lake Forest Park.

Descriptions of the work performed are summarized in the following text and full reports of each subject are included as appendices to this document.

Geotechnical

Topography

Upland (west) slopes vary from a steep, high bluff at the south end (a chronic landslide area), to moderately steep slopes up to 50 feet high, to 10- to 15-foot high cuts with shallow slopes above. The steep cut slopes appear to be within dense to very dense soils, with a minor covering (½ to 1 foot) of loose soil, derived from weathering and raveling of the slope (colluvium). At higher slopes with a shallow toe adjacent to the trail, the toe consists of an accumulation of colluvium and/or slide debris. The northern portion of the trail has a 10- to 15-foot high slope with the 10- to 15-foot high concrete retaining wall of N.E. Bothell Way at the top of the slope. A drainage ditch is adjacent to the trail at the toe of the uphill slope. The downhill fill slope ranges from two to 10 feet high and in most cases ranges between four to eight feet. Where bordered by driveways or streets, the fill is retained by some type of wall, typically a concrete block wall or rockery. Where the slope is into a yard or natural area, it typically consists of a vegetated slope at an inclination of 1½h:1v to 3h:1v. (See Appendix 2.)

Downhill slopes on both sides of the trail occur in the vicinity of N.E. 170th Street northeastward just past Ballinger Way, where the adjacent ground is at approximately the same grade or is somewhat lower than the trail. Deep, wet ditches parallel the upland (west) side in places, and McAleer and Lyon Creeks are crossed by the trail.

Geology

In general, the surficial geology in the study area consists of dense to very dense, glacially consolidated deposits forming the steep slopes, with loose to medium dense deposits derived from post-glacial erosion and landslides forming the low areas. The trail on the old track alignment was built on cuts into the dense soils and fills built over these, as well as over loose colluvium, alluvium, and beach deposits.

Various geologic units occur along the project corridor, very few of which have precise boundaries. The geology of an area can change drastically, both horizontally and vertically, within a few feet or, in some instances, can remain fairly consistent for hundreds of feet. In general, glacially consolidated, dense to very dense deposits are present within cuts and natural slopes uphill from the trail, and alluvium or beach deposits are present on the downslope side.

Landslide Area

South of N.E. 147th Street on the upland slope is an area of continuing landslides. In this area, materials above an elevation of about 70 feet are largely very dense fine to medium sand and below that are largely hard laminated clay/silt. Landslides here have been caused by erosion of the toe of the slope, weathering and sliding of the lower clay/silt material, and weathering and sloughing of the upper layer of sand. Slides in the upper region of the slope sometimes deposit debris on the lower slides, causing them to fail. Slides in this area have resulted in closing the trail for as many as three days. Groundwater seeps are present in this area as well as elsewhere on the upland side of the trail. Seepage saturates old slide debris downslope and also forms runoff that flows into the trailside ditch.

Seismic Hazard Area

According to the King County Sensitive Areas Map Folio, a seismic hazard zone exists east of Bothell Way from roughly N.E. 165th Street around the north end of Lake Washington to the project's limits and beyond to the Sammamish River delta. A seismic hazard zone is defined as an area subject to severe risk of earthquake damage as a result of seismically induced settlement or soil liquefaction. This means that in the event of an earthquake soils in the area could lose their ability to support a load. Some soils could actually flow like a fluid. Loss of soil strength could also result in surface settlement or cracking.

Stormwater

An analysis was performed to determine the capacity of culverts crossing under the trail. (See Appendix 3.) This work was done to assess potential for flooding of the trail and/or damage to the trail's subgrade strength from seepage through inadequately sized culverts. Both Lyon and McAleer Creeks are considered conveyance channels but weren't considered part of this study because the existing bridge crossings are considered adequate to accommodate flow.

Runoff from impervious surfaces and seepage from the uphill side of the trail is conveyed to Lake Washington by different means. In some places natural seepage is intercepted by a discontinuous drainage ditch running parallel with the trail. (Please see **Wetlands** section for additional description.) Additionally, runoff from roofs and driveways of residential units uphill from the trail and outside the trail right-of-way is in some places directed to the ditch. Water in this either percolates into the ground or is conveyed to culverts that take it under the trail to Lake Washington. In other areas surface runoff from impervious surfaces is collected by storm drainage piping and conveyed to culverts that carry the water under the trail to Lake Washington.

Drainage analysis was based on methods described in the 2005 King County Surface Water Design Manual (KCSWDM), which has been adopted by the City of Lake Forest Park. Upstream drainage basins for each culvert were mapped using topographic and drainage information provided by GIS mapping and as-built drawings of SR-522. Fourteen drainage basins associated with 17 culvert crossings were found in the study area and some basins were found to be drained by more than one culvert. A separate conveyance capacity analysis was completed for each culvert crossing. Many outfalls weren't located during the inventory as they are on private property. In those cases design assumptions were applied to flow calculations.

According to the KCSWDM, this redevelopment project is eligible for a direct discharge exemption from flow control. This means that detention facilities will not be required. Detention facilities are necessary where large volumes of runoff are anticipated and serve to slow down the water to prevent flooding and erosion. Lake Washington is a major receiving water body and may receive direct discharge of surface water runoff from this project. In addition, trail

redevelopment is not considered to be pollution generating because no motorized vehicles will be allowed and as a result, installation of water quality treatment facilities will not likely be required for improvements.

Wetlands

Studies were conducted in December 2003, January 2004, and March 2005 by a wetland scientist walking the length of the Burke-Gilman trail from north to south between Log Boom Park and approximately NE 145th Street at the north edge of the City of Seattle. (See Appendix 4.)

Wetlands were identified using the *Washington State Wetland Identification and Delineation Manual* (Ecology 1997). Wetlands were described using the classification scheme described in *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin, 1979).

The study area consisted of 50 feet on either side of the trail that was examined for the presence of wetlands, streams, and associated buffers. Dominant plant species and the presence of surface water were noted, and where plants and extent of surface water or soil saturation suggested the presence of wetlands, soils were examined using a hand auger or shovel. Locations where plant community composition, degree of soil saturation, and appearance of the soil satisfied the criteria for jurisdictional wetlands were identified as such on base maps. Water bodies that met the definition of a stream as defined in the Draft Lake Forest Park Municipal Code (LFPMC) Chapter 16.16.030 were also marked on the maps.

Definitions and descriptions of wetlands and streams contained in the Draft LFPMC were used for the purpose of classifying wetlands in this report. If the County proposes alterations within the study area in the vicinity of any sensitive areas, site-specific investigations to determine the exact boundaries should be performed at that time.

Six wetlands were identified: Wetlands A and B associated with the shore of Lake Washington, Wetlands C and D located in ditches near Lyon Creek, and Wetlands E and F associated with McAleer Creek. In addition, several ditch areas that meet the definition of wetland but which may or may not be regulated by Federal or local agencies were also identified.

Wetland A is a shrub-dominated wetland located at the edge of Lake Washington at Log Boom Park. This wetland is dominated by red alder, spiraea, and Himalayan blackberry. It is a palustrine scrub shrub (PSS) wetland according to the Cowardin classification system and would be considered a Class 2 wetland under the King County Code (KCC). This wetland is more than 50 feet from the main trail but within 50 feet of the lower paved trail that parallels the main trail as it passes through Log Boom Park. Under the Draft LFPMC, this would likely be considered a Class 3 wetland.

Wetland B is located along the shore of Lake Washington west of Log Boom Park. Like Wetland A, Wetland B is associated with Lake Washington. This has a forested component dominated by black cottonwood and also supports red alder, spiraea, and Himalayan blackberry. It is a palustrine forested/palustrine scrub-shrub wetland according to the Cowardin classification system. Due to its relatively large size this would likely be considered a Class 2 wetland under the Draft LFPMC.

Wetland C is south of Lyon Creek on the west side of the trail. It consists of a deep ditch surrounded by mature cottonwoods and sustains salmonberry, reed canarygrass, and English ivy. Wetland C contained between six and eight inches of water in January 2004 but had no surface

water in March 2005. Under the Cowardin classification system Wetland C is a palustrine forested (PFO) wetland. Under the Draft LFPMP this would be considered a Class 3 wetland.

Wetland D is on the east side of the trail just north of the intersection of the trail and NE 170th. It consists of a small shallow depression supporting a stand of reed canarygrass. No surface water was present in January 2004 or in March 2005. Wetland D is a palustrine emergent (PEM) wetland under the Cowardin classification system. Under the Draft LFPMP it would be considered a Class 3 wetland.

Wetland E is on the west side of the trail just north of McAleer Creek. It consists of a deep ditch that supports cottonwoods, salmonberry, Himalayan blackberry, and reed canarygrass. This wetland appears to be hydrologically connected to McAleer Creek. It contained shallow surface water in January 2004 as well as March 2005. Under the Cowardin classification system this is a palustrine forested (PFO) wetland and under the Draft LFPMP would be considered a Class 3 wetland.

Wetland F is on the west side of the trail just south of McAleer Creek. It consists of a relatively deep ditch and supports cottonwood, Himalayan blackberry, and English ivy. The wetland contained between four and eight inches of water in January 2003. It is a palustrine forested (PFO) wetland under the Cowardin classification system and under the Draft LFPMP would be considered a Class 3 wetland.

Potentially regulated Wetlands associated with drainage ditches. In addition to the wetlands described above, the shallow ditch along the north and/or west edge of the trail may or may not be regulated by the City of Lake Forest Park. While this feature is apparent along much of the length of the study area, it is completely absent for several discontinuous lengths. Where it exists, it is variably well defined, ranging from a shallow swale containing mowed grasses and saturated non-hydric soil, to a well-defined channel supporting obligate (growing only in wet soils) plant species and containing several inches of flowing water. In some locations this ditch would qualify as a wetland. However, it may be that these areas would not be regulated by the County because they would be considered man-made and maintained ditches. The U.S. Army Corps of Engineers (COE) will likely regulate sections of ditches that do not meet the definition of jurisdictional wetland as “waters of the United States”. In general the areas most likely to be considered regulated wetland are associated with the culverts that direct water from the west under the trail and out toward Lake Washington.

The determination of whether or not these areas would be regulated as wetlands by the City of Lake Forest Park or as wetlands/“waters of the U.S.” regulated by the COE would need to be made by those agencies, based on the results of site visits.

Regulatory Considerations

In order to satisfy the Washington State Growth Management Act’s (GMA) requirement to include best available science in sensitive areas regulations, City of Lake Forest Park is in the process of updating its critical areas regulations. Under the Draft LFPMP it is likely that the wetlands identified along the trail would be considered either Class 2 or 3 wetlands. Depending upon the actual category, these wetlands would be required to have standard buffer widths of either 100 or 50 feet. Under the current draft, standard buffer widths may be reduced in certain cases if done in combination with buffer enhancement.

Limitations

When a proposal to reconstruct or alter the current configuration of the trail is developed, project-specific investigations, including formal wetland and stream delineations, should be conducted in compliance with Federal and local regulatory requirements.

Under the City of Lake Forest Park's Ordinance 907 the trail surface width will have to be constructed with permeable material where it passes through any wetland and stream corridor buffers.

Streams

Lyon Creek flows 3.8 miles through Lake Forest Park before draining into Lake Washington north of Ballinger Way N.E. The stream has been impacted by high storm flows that have degraded soil substrate and reduced spawning habitat. Historically, sockeye and coho salmon as well as cutthroat and rainbow trout have been observed in Lyon Creek. Sockeye were observed in the creek in 2000 by volunteer Salmon Watchers. (See <http://dnr.metrokc.gov/wlr/waterres/streams/lyon.htm>)

McAleer Creek originates at Lake Ballinger and flows roughly six miles to drain into Lake Washington just south of Lyon Creek. Much of the watershed was developed in the late 1970s at which time virtually no stormwater retention/detention facilities were built to mitigate the effects of development on the stream system. This resulted in increased transport of suspended sediments in the creek. Nevertheless, chinook, sockeye, kokanee, and coho salmon as well as steelhead, rainbow, and coastal cutthroat trout were observed in McAleer Creek in 2002. (See <http://dnr.metrokc.gov/wlr/waterres/streams/mcaleer.htm>)

Wildlife

In April 2005 a field survey was conducted to inventory habitat features and habitat for priority species in the study area. (See Appendix 5.) The work included a review of Washington State Department of Fish and Wildlife (WDFW) priority habitat and species data.

Habitat Description

Land use along the trail varies from developed parkland to residential and commercial zones. Most of the study area is characterized by residential land uses and therefore native forest and shrub habitats are sparse.

Narrow strips of native habitats are found from Log Boom Park to Ballinger Way and from NE 147th Street to NE 145th Street. Habitat conditions vary in these sections. Large trees including black cottonwood and Lombardy poplars provide habitat in these sections, but understory vegetation is mostly dominated by non-native, invasive plant species such as Himalayan blackberry and English ivy.

Lake Washington, immediately east of the trail, as well as Lyon and McAleer Creeks provide aquatic habitat for many fish and wildlife species.

Wildlife Observations

Several bird species were abundant along the trail, including American crow, European starling, house finch, house sparrow, American robin, black-capped chickadee, Bewick's wren, song sparrow, bushtit, and spotted towhee. Breeding behavior and nest-building activities were evident for several of these species including bushtit, black-capped chickadee, American robin,

and Bewick's wren. One bald eagle was observed perched in a tall conifer adjacent to the trail in a residential area near NE 155th Street.

Several bird species were identified in Lake Washington near the trail. Waterfowl species on Lake Washington near Log Boom Park included mallard, bufflehead, greater scaup, common merganser, American coot, and western grebe. American coot and western grebe were present in large congregations. Violet-green swallows were seen foraging over the water of the lake, and double-crested cormorants were seen foraging in the lake and perching on the pilings at Log Boom Park.

Priority Habitats and Species

Lake Washington provides foraging opportunities for large congregations of waterfowl and for raptors such as the bald eagle. Although the trail is within an active bald eagle nesting territory, the one known nest is in Saint Edwards Park across Lake Washington, approximately one mile east of the trail at NE 145th Street (WDFW, 2003). A bald eagle was observed perching near the trail across the lake from this nest. No other priority habitats or species were observed during the survey or recorded by WDFW near this section of the Burke-Gilman trail. Construction activities occurring more than 0.5 mile from bald eagle nests are not likely to disturb nesting activities (U.S. Fish and Wildlife Service, 1999).

Vegetation

In March 2005, trees and tree groups along the Burke-Gilman T rail were evaluated to determine their health. A general assessment of all the trees over six inches in diameter (four inches if unusual or multi-stemmed) within the trail right-of-way was made. The assessment included trees on both sides of the trail except for those growing on the steep west slope. The City of Lake Forest Park does not exempt any tree species from regulations. The full report is included in Appendix 6.

Trees were evaluated with guidelines established by the International Society of Arboriculture's Tree Hazard Evaluation Form and the Tree Condition Assessment Form used for tree appraisals, per the *Guide for Plant Appraisal, 9th Edition*. The health assessments were performed without excavation or internal examination such as coring or drilling. Root flares were inspected if they were accessible.

Most of the 100 tree groups or individuals in the study area were found to be healthy, although some will outgrow their location (for example the cottonwoods growing close to Beach Drive NE). The health ratings listed in Appendix 6 may need to be revised if conditions change. Many species are susceptible to losing branches during wind or ice storms. Trees covered in ivy will need to be rechecked once the ivy has been removed.

There are many damaged, dying trees growing on the steep slope west of the trail and at the west property line underneath utility wires. The decline is mostly the result of topping cuts by adjacent property owners.

The result of the overview evaluation indicates that trees along the trail are mostly in good health and are well suited to this wet site. However, this is not a guarantee of long-term safety and tree health will change over time as certain species reach the end of their life cycles.

Built Environment Considerations

Land Use

Approximately two miles of the total 27-mile long Burke-Gilman Trail are within Lake Forest Park city limits. The primary land use adjacent to the trail corridor is low density single-family residential. Other land uses within 200 feet of the corridor are designated multi-family, park, commercial/business, and mixed-use town center. Public and private recreation facilities within the trail corridor include Sheridan Beach Club, Lake Forest Park Civic Club, and Lyon Creek Preserve.

Among the policies relevant to the trail is the ***Lake Forest Park Comprehensive Plan***. This plan, adopted in 1995, revised in 2001 and under revision again in 2005, establishes goals, policies and plans in regard to land use and development in accordance with the GMA. Policies relevant to the current trail study are found throughout the document, including ***Environmental Quality***, ***Capital Facilities***, ***Recreation and Open Space***, and ***Transportation***. In general these support alternatives to driving and encourage the use of non-motorized transportation. (Refer to www.cityofflp.com/city/compplan/default.html)

Also relevant to redevelopment along the trail is the ***Lake Forest Park Municipal Code***. Any construction within the existing Burke-Gilman Trail corridor falls under the jurisdiction of the City of Lake Forest Park. Title 16 of the city's Municipal Code addresses environmental protection issues. Sections ***16.16.010*** through ***16.16.410*** in ***Chapter 16.16*** list information relevant to redevelopment along the Burke-Gilman Trail. (See www.cityofflp.com/city/municode.html)

The Burke-Gilman Trail corridor is owned and operated by King County as part of the regional trail system. The ***King County Comprehensive Plan*** (2004) guides regional services, such as transit, sewers, parks, trails and open space within the County. (Refer to www.metrokc.gov/ddes/compplan/) In addition, management of regional parks, trails, natural areas, and working resource lands is guided by the King County ***Parks, Recreation and Open Space Plan***, as adopted in 1996 (and subsequent updates).

King County Shoreline Regulations apply to lakes 20 acres or more in size, to shorelines along streams with a mean annual flow of 20 cubic feet or more per second, and to marine shorelines of Puget Sound and wetlands associated with these shorelines. Certain segments of the Burke-Gilman Trail corridor fall within 200 feet of the shoreline of Lake Washington. Under the Washington State ***Shoreline Management Act*** the shoreline of Lake Washington is designated as a Shoreline of State-Wide Significance. Public pedestrian and bicycle trails are permitted uses. The City of Lake Forest Park relies on King County's ***Shoreline Master Program*** (KCC Title 25) to regulate applicable shorelines. At the time of this writing the city is developing a Shoreline Master Program. (See www.metrokc.gov/ddes/SMP/ShorelineMapping.shtm)

Traffic

This study, conducted in the summer of 2004, includes trail crossings between NE 147th Street to the south and Ballinger Way NE to the north. (See Appendix 7.) Eleven points were assessed, eight of which were crossings where minor streets or driveways serve as single access points to fewer than 50 homes. One is an intersection with a higher volume street traffic (N.E. 165th Street) serving as an access point for a residential area and the Sheridan Beach Club. The remaining two crossings are at signalized intersections.

Trail volumes were collected on three days at two locations and users were counted as well as categorized as bicyclists, pedestrians, skaters or others. The 12-hour totals were 1,262 1,361 1,496 respectively. Over 80 percent of trail users were cyclists. Pedestrians composed from 13 percent to 17 percent of trail users.

In terms of vehicle traffic, specific counts were not made. Volumes of vehicles crossing the trail at residential access drives were derived from Institute of Transportation Engineers (ITE) trip generation manual for “single-family detached housing.” These characterize the average number of trips generated per day by single-family homes for both weekdays and weekends (Saturdays). According to ITE, it is expected that the average single-family home generates 9.57 trips per day on a weekday and 10.1 trips per day on a Saturday. Calculations for this study round both of these numbers to 10. For access drives, the number of vehicle crossings is equal to the number of homes multiplied by 10. The southern part of the study area has trail crossings that serve between 1 and 39 homes on the east side of the trail. This means that the highest number of vehicles crossing the trail at any one of these points would be roughly 390 vehicles. When compared to bicyclists during a similar (12-hour) time period, trail use was nearly three times as high.

At the N.E. 165th Street trail crossing further study is needed to determine actual vehicular traffic volumes and this will be done in the next phase of work. For this study it is assumed that trail counts will be higher than crossing vehicular traffic.

Trail Right-of-Way Priority

Two major factors determine “major” and “minor” legs of an intersection: roadway volumes and travel speeds. The major leg is given priority by controlling or limiting traffic movements of the minor leg. Given the roadway volume, trail use data, and travel speed data, the trail should be designated the major leg at intersections where minor streets or driveways provide residential access to fewer than 100 homes.

Traffic Control Standards

The *Manual of Uniform Traffic Control Devices* (MUTCD), issued by the U.S. Department of Transportation, Federal Highways Administration, is adopted by reference. This is the national standard for all traffic control devices installed on any street, highway, or bicycle trail open to public travel. It also provides guidance with regard to uniformity. Along other parts of the trail, where minor local access roads and driveways intersect the 27-mile trail – in Seattle, for example – the trail is treated as the major crossing. Motor vehicles are typically stopped or must yield to crossing bike/pedestrian traffic.

Signage History

The 1975 Burke-Gilman Trail Supplement to the Final Environmental Impact Statement stated that motorized vehicles would be granted the right-of-way at all street intersections and that stop signs would be posted. Private crossings of the trail were not considered street intersections and were not signed or controlled as the trail was granted right-of-way.

Placement of current stop controls at several private driveways along the trail is contrary to standard engineering practice. No record of engineering studies related to placement of these signs has been found. Discussions with County staff indicate that the placement of stop controls on the trail at certain locations was based on directions of a former King County Councilmember in response to requests from local residents.

Bicycle Speeds and Stop Compliance

Traveling speeds of bicycles were collected at a location south of NE 151st Street and were measured on a random sampling of a total of 500 bicyclists over a three-day period (June 2, 3, and 5, 2004). The data indicated that 84 percent of bicyclists were traveling over the posted speed limit of 10 miles per hour at an average bicycle speed of 13.6 mph. While 15 percent of the bicyclists traveled at a higher speed, 85 percent traveled at or under 17 mph. Bicycle speeds ranged from 5 to 21 mph and compliance with stop signs at intersections was very low. Less than three percent of the bicycles came to a full stop before proceeding through the intersection.

Accident History

Finding information related to accident reports has been difficult. Accidents occurring along the portion of the trail running through Lake Forest Park would be reported to the city's police department. King County Sheriff's Department would refer any reports of accidents along this portion of the trail to Lake Forest Park police staff. No reports of accidents were filed with the police from January 2000 (as far back as records are kept) to May 2005. However, while no accidents were found on the Burke-Gilman Trail, a vehicle/pedestrian accident report was filed for an incident at Beach Drive.

Accident reporting goes through the Eastside Public Communications Agency (associated with the Crossroads Fire Department), which is the agency responsible for responding to 911 calls for this area. A search of the Northshore Fire Department records found that on average three accidents severe enough to warrant aid occur each year along the trail, although fire department staff believe less severe accidents don't get reported. Not all of the calls to which this fire department responded were vehicle/pedestrian accidents. Fire department staff believe most accidents occur in the area near Log Boom Park in Kenmore. The light at Ballinger Way may also be an area where accidents are concentrated.

Medic One and Fire District staff file reports with the King County Health Department; however, the latter does not allow review of its records. Because of the interest generated by this redevelopment project, the City of Lake Forest Park has begun a system for recording accidents along the Burke-Gilman Trail.

Site Distance Concerns

Trail users and drivers need time and space to decide if it is safe to enter an intersection or crossing, an interval called sight distance or sight triangle. Obstructions to adequate sight distance at crossings in the study area include driveways and roads on steep grades; horizontal curves in roadways and the trail; and the presence of trees, shrubs, utility poles, fences, as well as other objects at road crossings. Sight distances for trail redevelopment purposes are determined by the speed of the bicycles as well as those of vehicles.

Stopping Sight Distance

An approach sight triangle should provide the driver of a vehicle approaching a crossing an unobstructed view of any trail users. A triangular area is taken from the intersection of the line of sight for both trail users and cross traffic, and based on the speed of trail traffic as well as that of vehicular traffic. For this study a speed of 20 mph is assumed for bicycles and a speed of 3 mph is assumed for vehicles.

For trail crossings in the study area, a decision point 19 feet back from a trail crossing is needed for vehicles traveling at three mph or less approaching a non-controlled crossing to be able see cyclists traveling at an average of 20 mph 127 feet before entering the intersection. Additionally, from a decision point 127 feet back from the intersection, cyclists approaching a non-controlled

intersection should be able to see potentially conflicting roadway cross-traffic entering the crossing.

Recommendations

Redesign of the trail should incorporate adequate sight distance to the greatest extent possible by removing obstacles impeding sight distances. Uniform markings should be provided for trail users to warn of crossing vehicular traffic and driveway-crossing widths should be uniform. Trail and roadway signage should be modified to reflect best engineering practices and controls provided at the vehicular legs with warnings provided for trail users. Only when adequate sight distance cannot be achieved should trail traffic be stopped. In such cases, all legs of the intersection should be stopped, using recommended signage. Where multiple driveways cross the trail in close proximity, efforts should be made to consolidate those driveways wherever possible.

Pavement Markings

AASHTO recommends the use of pavement markings at intersections to channel trail users to cross at clearly defined locations while also providing a message to motorists that the intersection must be shared with other users.

Traffic Control Signs

A series of traffic control signs are proposed. Typical for this project would be: Yield signs, Yield Ahead signs, Stop signs, Intersection warning signs with “Look” plaques, Intersection warning signs with Distance Warning plaques, Bicycles Use Pedestrian Signal signs, and Advance Traffic Control signs with Distance Warning plaques.

Treatments Considered but Not Recommended

The use of convex mirrors at intersections and driveways should not be relied on for primary control because of the distortion in distance the lens creates. These mirrors have limited sight distance and don’t always provide a complete field of view.

A member of the Lake Forest Park City Council has proposed installation of actuated pole-mounted or in-pavement flashing warning lights at certain private driveway crossings to warn trail users of approaching vehicular traffic. Such installation is not recommended. Providing clear sight lines by removing obstructing vegetation and fences as well as installation of overhead lighting at all crossings will create safer conditions. Consistency is also an issue as nowhere else along the Burke-Gilman Trail are such devices used.

A CAG member requested consideration of bicycle lanes separated from vehicles and pedestrians at intersections similar to those installed at UC Davis and several locations in the Netherlands. After studying specific conditions of each the consulting team recommended against use of special bicycle signals and lanes at intersections.

Utilities

Public utilities within the trail corridor include sanitary sewers, fiber optics cables, and water delivery. Electrical power, including street lighting, is also included. Storm drains are discussed above. Relocation and potential undergrounding of utilities with relationship to proposed trail widening will be addressed as necessary during the next phase of the project.

Public Participation

Public input has been collected throughout the process of redevelopment planning and includes comments taken at public meetings as well as written responses to questionnaires created by King County staff. Members of the public have also made their views known to staff at both the City of Lake Forest Park and King County via email and letters. The intent of collecting input has been to insure that major concerns are addressed.

In addition, the Citizen Advisory Group (CAG) has represented viewpoints of trail users and/or local residents. At monthly meetings CAG members listened to and commented on presentations from subconsultants (cited above). Trail walks with CAG members, King County staff, and the design team allowed informal site studies and an opportunity for CAG members to comment further on redevelopment concepts.

Among trail users and local residents the most common point of contention has been bicyclists who travel too fast or who travel in packs with little regard for others. Conversely, many cyclists complained about uncontrolled pets on the trail, children unable to control their bikes, and trailside homeowners using trail right-of-way for parking vehicles. Other comments from trail users include the condition of the trail's surface, lack of enforcement relating to speeding cyclists, lack of lighting, and lack of maintenance on the part of King County.

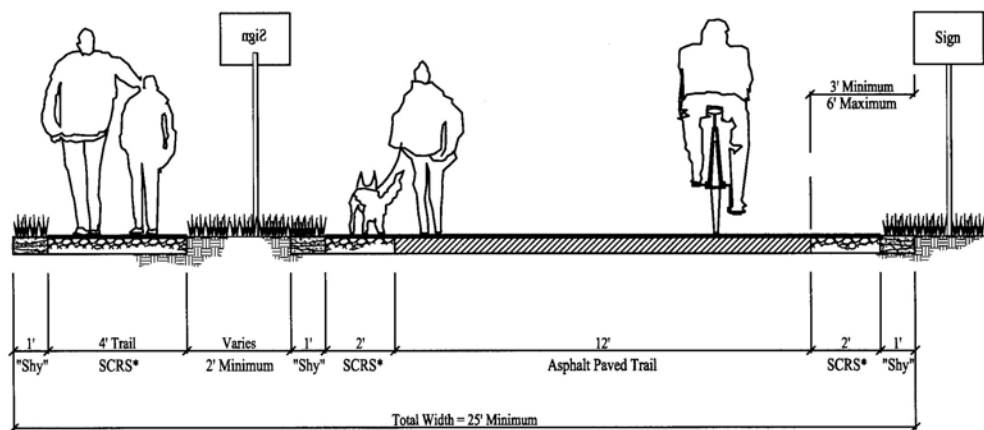
Among trailside homeowners the most common concern was the potential danger of crossing the trail because of cyclists traveling at what are perceived to be excessive speeds. A number of these homeowners have garages in the trail right-of-way or within a few feet of it and a few regularly back across the trail to leave their homes. Many described the difficulties presented in winter when the trail is dark and some cyclists have inadequate lights on their bikes. Some of the private driveways are at a steep grade change, and many also have fences and/or screening hedges that impede sight distance. A number of trailside homeowners also expressed concerns about drainage and lack of maintenance on the part of King County.

Burke-Gilman Trail Redevelopment Study Part II – Recommendations

Background resources for trail redevelopment include King County's *Regional Trail Inventory and Implementation Guidelines* (2004), the American Association of State Highway and Transportation Officials' (AASHTO) *Guide for the Development of Bicycle Facilities* (1999), the Washington State Department of Transportation's *Bicycle Facilities Design Guidance*, and the Rails-to-Trails Conservancy's *Trails for the Twenty-First Century* (2001). These resources, combined with technical information provided by subconsultants and input from CAG members, were used in the decision-making process for trail redevelopment.

King County's *Regional Trail Inventory and Implementation Guidelines* include three preferred trail cross sections. Alternative 1 has a total width of 25 feet and differs from the other two by providing a four-foot wide surface of stabilized crushed rock for pedestrians with an intervening buffer to separate them from cyclists using a 12-foot wide paved surface. On the other side of the paved surface is an additional two-foot wide shoulder of stabilized crushed rock.

King County alternative trail sections



Alternative 1

Scale: 3/4"=1'-0"

*Stabilized Crushed Rock Surfacing

Figure 3. King County Alternative 1

King County's second alternative would create a 12-foot wide paved trail with a five-foot wide shoulder of stabilized crushed rock surfacing immediately adjacent on one side and a two-foot wide shoulder on the other side. No physical barrier between users would be provided. Total width would be 21 feet.

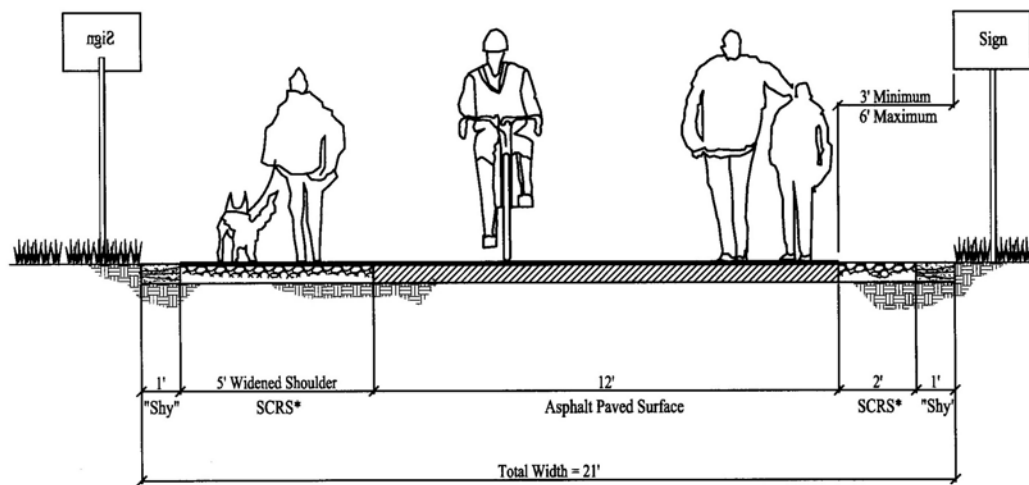


Figure 4. King County Alternative 2

The County's third alternative would create a three-foot wide shoulder of stabilized crushed rock surfacing on one side of the 12-foot wide asphalt-paved trail and a two-foot wide shoulder on the other side. Total width would be 19 feet.

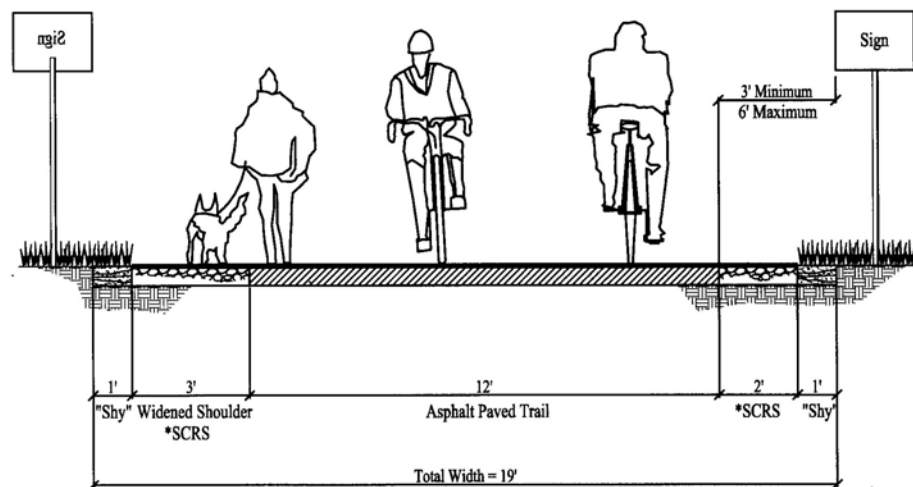
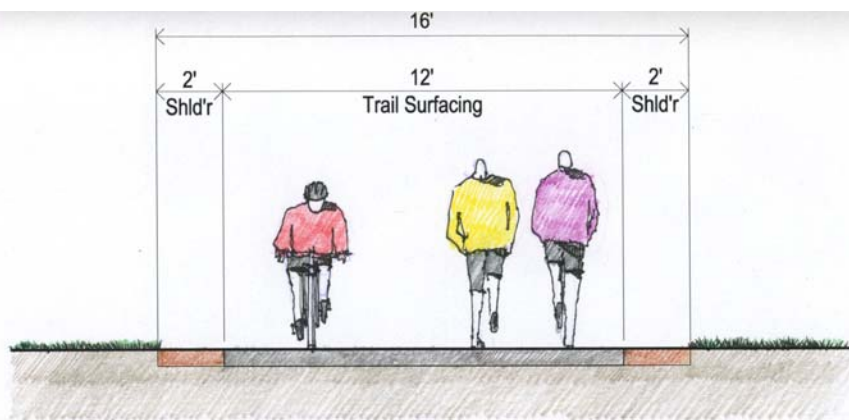


Figure 5. King County Alternative 3

AASHTO minimum trail section

The minimum width possible that would still meet current AASHTO standards would be 2 feet/10 feet/2 feet. (See detail below.) While this would provide a good walking surface on the two-foot shoulders, the profile would be narrow.



AASHTO Minimum Trail Section



Recommended Trail Section

Figure 6. AASHTO Minimum Trail Section and Figure 7. Recommended Trail Section

It must be remembered that if the trail is to receive federal or state transportation funding, revenue sources will require that design follow current AASHTO standards. Many transportation agencies will not fund a trail that is not designed to accommodate commuting cyclists as well as pedestrians and other users.

Based on the need to accommodate an increasing number of trail users as well as the need to reduce conflicts between foot and bike traffic, the design team recommends a redesigned trail that is 3 feet/12 feet/3 feet. The recommended trail section is a 12-foot paved surface with 3-foot shoulders of stabilized crushed rock on either side. (See Figure 7.)

Applying the recommended trail dimensions

Applying this recommended dimension within the restrictions of the corridor will mean adapting the alignment to varying conditions, based on site constraints. In some places the existing trail would be widened to the east and in others to the west. Between 170th N.E. and N.E. Ballinger Way, for example, if it is determined that wetlands are present on the west side, widening would move to the east. North of 165th Street the bench of the trail right-of-way broadens enough that an 18-foot cross section of trail could fit within the current configuration with few alterations.

Toward the southern end of the study area erodible slopes on the west side of the trail may require further assessment to determine their structural integrity. Should it be decided that any cutting into the slope would compromise its stability, widening would have to move east. On the east side of the trail, however, at several locations property owners have encroached into the trail right-of-way. While every effort would be made to avoid impacting individual residents, some grading may be required on the east side of the trail, requiring fencing, planting, and wall construction. Planting along new fences could include materials that preserve views as well as the character of the neighborhood. The schematic design phase of the project will complete additional technical studies as necessary to make final layout and alignment decisions.

Examples of constraints and alignment adaptations:

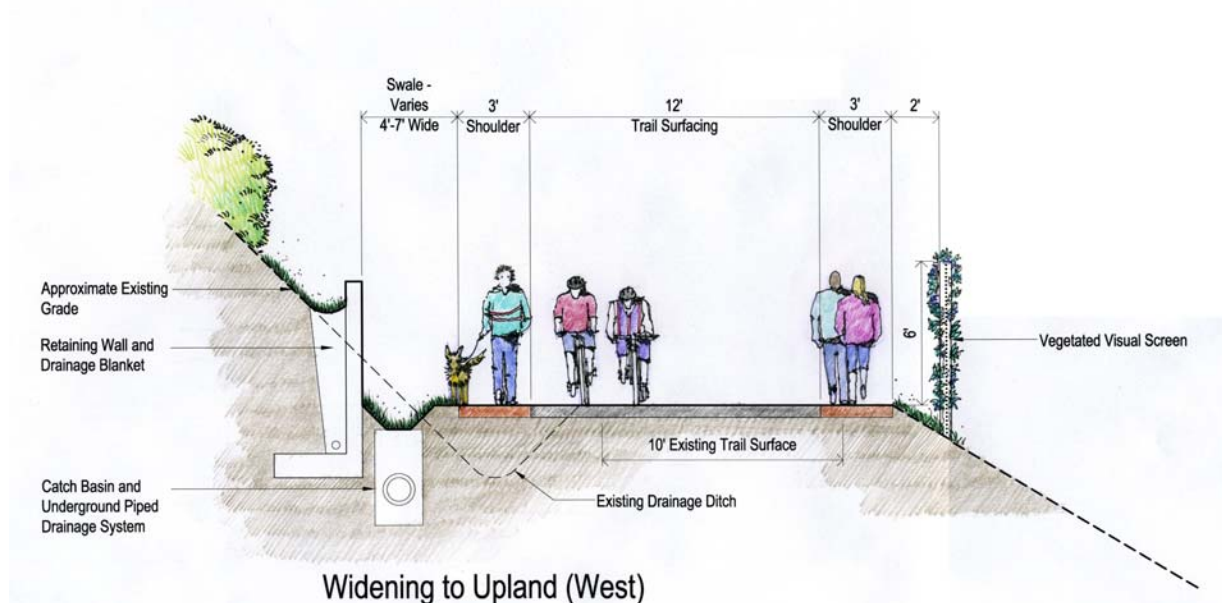


Figure 8. Potential widening to upland (west)

Slopes on the upland side combined with existing drainage ditches present constraints to redevelopment. Widening in this direction would require cutting into slopes, building walls, and reconstructing drainage ditches. A new stormwater collection system would require underground piping with catch basins tied into existing under-trail culverts and a retaining wall with appropriate drainage features. If the City of Lake Forest Park declares the ditches to be wetlands that must be regulated, mitigation will be required. While widening to the west would reduce

impacts to homeowners east of the trail it could result in claims from uphill property owners should the integrity of the slope be undermined by construction activities. Building a new drainage system could make widening on this side very costly.

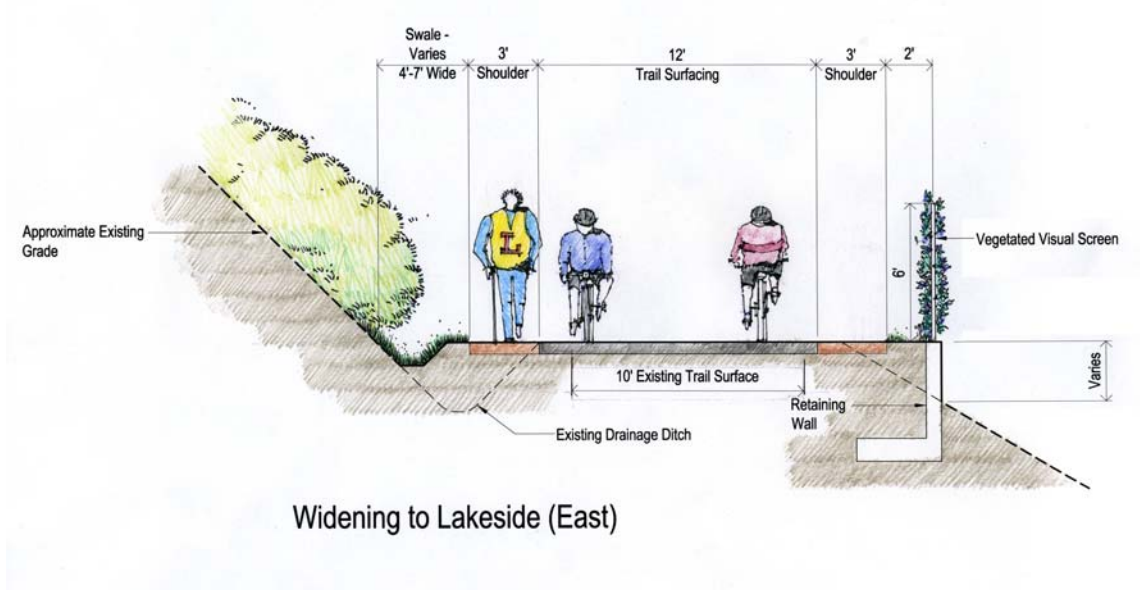


Figure 9. Potential widening to lakeside (east)

By widening the trail to the east, drainage ditches would not require extensive engineering and could continue to function as open swales. Slope integrity would be preserved. Drainage in the ditches would have to be reassessed, although it is anticipated fill could be added to gain space for the addition of a three-foot shoulder. Space for a three-foot shoulder east of the trail could be gained by building a retaining wall. The height of the wall would be determined by the extent of expansion to the east. Costs for the retaining wall would increase with height.

Homeowners to the east, especially those with encroachments within the trail right-of-way, would be impacted by trail widening in this direction.

Proposed signage

At each private driveway crossing installation of appropriate signage will include Intersection Warning signs with “Look” plaques for trail users and Yield signs for vehicular traffic. Yield sign warnings will be installed where appropriate for drivers and distance-warning signs will be put in place for trail users where appropriate.

Trail surface

A minimum six inches of stabilized crushed rock surfacing is recommended for the proposed three-foot shoulders of the widened trail. This would be done in conjunction with a two-inch minimum depth of new asphalt over the existing pavement. Intruding tree roots would be removed and the surface patched to create a smooth surface. In sensitive areas (wetlands, stream buffers) the three-foot shoulders would be a minimum of six inches of engineered wood fiber and the trail surface would be a four-inch minimum depth of pervious concrete or asphalt pavement underlain with a four-inch minimum depth of granular base.

Trail crossings

Removing fences and overgrown vegetation that currently obstruct clear vision at trail crossings will improve sight distance and make the trail safer for both trail users and crossing vehicles. Based on national standards, “Stop” signs for trail users at private driveways will be removed and replaced with “Yield” signs for vehicular traffic. Consolidating driveways where possible will reduce the number of trail crossings and therefore reduce potential trail user/private driveway crossing issues. These crossings should be similar in length and should be striped. Hinged tubular markers will be retained. Trail shoulders would be reduced to two feet wide at crossings. Overhead lighting will be provided at all crossings.

Bridges

Existing bridges over McAleer and Lyon Creeks have decks that are 12 and 8.5 feet wide, respectively. Suggested improvements for the two existing bridges include widening to a 12-foot wide travel zone coupled with two-foot wide clear areas on either side. In the event of widening, these structures would either need to be rebuilt wider over existing foundations or would have to be completely rebuilt. Any alterations to the bridges will require Hydraulic Project Approval (HPA) permits from the Washington State Department of Fisheries.

Street intersections and driveway crossings

Incorporated into the following text are comments written by nine of the 14 CAG members on the evening of August 16, 2005, when they joined staff from King County and the design firm Atelier PS for a walk along the trail to assess intersections and crossings from Ballinger Way N.E. south to N.E. 147th Street. Included are comments from Tim Ahearn, Kate Comtois, Gary Elmer, Mark Gibbons, Sandy Koppenol, Michelle LeMoine, Alison Starling, Ed Sterner, Stuart Strand, and Dean Peterson. CAG members were given 8½ x 11” maps of each intersection as well as red pens and instructed to write their thoughts as the group convened at each crossing along the trail. Their comments are listed below in italics. Also included are numbers in parenthesis indicating the number of times different CAG members made the same comment. Figures for each crossing/intersection are included as Appendix 8.

General comments from CAG members:

- *The three-foot gravel or other walking/jogging material on each side very important to be easier on the knees and keep away from bikes*
- *Would like to have mile markers*
- *Want as much consistency on trail signage across Lake Forest Park as in Seattle, before and after Kenmore.*
- *Agree with sight lines and removing foliage*
- *Remove all chicanes*
- *Generally well thought out. Good design*

At the signalized intersection of **Bothell Way/Ballinger Way N.E.** minor adjustments are recommended for the right turn radius from Bothell Way to Beach Drive N.E. in order to slow vehicles approaching the trail. Two existing trees would be removed in reconfiguring and widening the trail. On the north side of the intersection the trail’s alignment would be somewhat modified and the gradient could be adjusted to improve visibility. An enhanced wayside/rest area would be created and equipped with benches and trash receptacles while in the same area a larger queuing area would be created for trail users waiting for signal changes. The existing traffic signal would be relocated and new signs would be installed informing cyclists to follow the pedestrian light signal. Consideration should be given to installing a “No turn on red” sign to

prevent motorists existing Beach Drive N.E. (heading west). Drivers here often fail to look right to see if trail users are approaching, especially when trail users have a green crossing light. (See Appendix 8, Intersection Improvements #9)

CAG comments:

- *Gradual curve [from trail to queuing area] is excellent (3)*
- *No right turn on red (3)*
- *Consider separate bicycle signal*
- *Make queuing area as wide as possible, wider than shown (5)*
- *Make more of the sidewalk ramped*
- *Tree removal needed*
- *Regrade trail approaching intersection to make less steep (2)*
- *If need to take out trees north of building, take out trees closest to Bothell Way first*
- *Yes, relocate traffic signal (4)*
- *Make connection to Lyon Creek Park (5)*
- *Reconfiguring right turn from Bothell Way N.E. to east is good*
- *Install rail on east side of queuing area south of intersection*
- *Add sign “Do not cross here. Use crosswalk” on north side of intersection across Bothell Way N.E.*
- *Show pavement striping on south side of intersection across Bothell Way N.E. on maps*
- *Looks good – controlled by red light – no homes close to intersection. No problems*

Similarly, where the trail crosses **Bothell Way N.E./N.E. 170th Street** a minor change would be made to smooth the radius from Bothell Way to Beach Drive N.E. to slow down vehicles making right turns. Two trees would be removed to provide space for a wider trail. A larger queuing area would provide more space for trail users waiting for signal changes. The existing traffic signal would be relocated. Pedestrians and bicyclists using crosswalks are at risk from vehicles turning right on red lights on to Bothell Way N.E. because right-turning drivers are focused on vehicular traffic on their left and don't look to the right. Restricting northbound vehicles from making a right turn on a red light could improve safety for trail users. Appropriate signs would be provided for cyclists regarding traffic signals. (See Appendix 8, Intersection Improvements #8)

CAG comments:

- *Good to move traffic signal (3)*
- *Move junction box and poles back!*
- *No right turn on red (4)*
- *Make queuing area as wide as possible*
- *Gradual curve is better (2)*
- *Install cross east-west striping across Bothell Way N.E.*
- *Controlled by red light. No close homes – changes should be ok*

At **N.E. 165th Street/Beach Drive N.E.** intruding vegetation impedes sight distance to the trail (south) and the crossing currently is posted with stops for both vehicles and trail users. Further studies during the next phase of work will determine volume of vehicular traffic crossing the trail. At the time of this writing removal of trail Stop signs is proposed because necessary sight distances can be achieved and priority given to trail users. Vehicular Stop signs would remain, although one would be moved east of the trail and vehicles would continue to stop. Existing jogs in the trail would be removed and the trail straightened. Striping would be retained in accordance with MUTCD standards. Overhead trail lighting would be provided and appropriate signs (listed

above) would be installed. Hinged tubular markers in the center of the trail would be retained to prevent vehicles from accessing the trail. Six-foot high fences with vegetative screening would be provided on either side of the trail right-of-way south of the intersection. (See Appendix 8, Intersection Improvements #7)

CAG comments:

- *Yes, remove chicane (3)*
- *Improve sight lines (2)*
- *At 16202 [Beach Drive N.E.] why not remove fencing?*
- *Move crossing to next to road*
- *Trail should at least yield to road.*
- *Need sufficient light to see bikes during commuter hours in winter*
- *Appreciate that cars have to stop for bikes and lighting will add to visibility of cyclists*
- *Yes, relocate Stop sign*
- *Yes, good proposed design*
- *Widest intersection in Lake Forest Park. Homes are not affected much by proposed changes. Beach Drive is a buffer – trail is not too close*

The trail crossing at **N.E. 157th Street/residential access** would be improved with appropriate striping, appropriate signs, hinged tubular markers, and with overhead trail lighting. Vegetation east along the trail that currently impedes sight distance would be removed. On the east side a six-foot fence with vegetative screening would be installed to provide screening and privacy where possible. Retaining walls may be necessary on either side of the driveway if it is reconfigured so that the gradient approaching the trail crossing is consistent with recommended standards. (See Appendix 8, Intersection Improvements #6)

CAG comments:

- *Maybe vehicles should have a Stop sign, not just a Yield sign*
- *Yes – clear vegetation from all sight lines!*
- *Given very tricky drives and topography trail should continue to Yield - possibly try lights*
- *Good design*
- *Important – homes are very close to trail. Discuss all proposed changes with homeowners*

A consolidation of trail crossings in close proximity is proposed at two residential drives north of **N.E. 153rd Street** east of Lakeshore Boulevard. Overhead trail lighting, approved striping and traffic control signs, as well as hinged tubular markers would be provided. An existing wide section on the northwest side of the trail would be eliminated. A six-foot high fence would be installed and planted with vegetation to act as a screen on the east side of the trail. A guardrail should be installed for the homeowner whose driveway is reconfigured to prevent incursion into the trail. (See Appendix 8, Intersection Improvements #5)

CAG comments:

- *Important to increase visibility here*
- *Great idea to eliminate driveway (2)*
- *Level out stopping area for better vision*
- *With topography good candidate for use of warning lights in lieu of major excavation. Could achieve safety without as much environmental impact or expense.*

- *Discuss all changes to combine driveways with affected homeowners – their opinions must be heard!*

Of the two residential access drives at residential access drives north of N.E. **153rd Street**, the northern drive would be reduced in width in keeping with other driveway crossings. Overhead trail lighting, striping, hinged tubular markers, and appropriate signs for traffic control would be provided at both crossings. Improved sight distance would be accomplished by removing existing shrubs that obscure vision. For the trail to widen to the east a retaining wall would be built and a six-foot high fence with a vegetative screen built to provide privacy for homeowners to the east. (See Appendix 8, Intersection Improvements #4)

CAG comments:

- *With close crossings and difficult approaches, possible place to try warning lights.*
- *Lots of vegetation to remove*
- *Removing vegetation from sight lines great!*
- *Good design*
- *All proposed changes to landscaping must be discussed with nearby homeowners*

The crossing at **N.E. 153rd Street/Beach Drive N.E.** would be reduced in width in keeping with other trail crossings. Like previously described driveway crossings, this would be provided with striping, overhead trail lighting, and appropriate signs. The trail would be straightened as two existing jogs would be removed. Necessary sight distance would be gained by removing impeding vegetation. A wall would be necessary for expansion to the east and a six-foot high fence would be installed, planted to create a screen for trailside residents. (See Appendix 8, Intersection Improvements #3)

CAG comments:

- *Steep approach from east*
- *With 18' plus sight lines - major reconstruction*
- *Be sure Beach Drive not a city street south in right-of-way*
- *Typical warning sign "Cars yield to trail" should be installed*
- *Discuss changes proposed with local homeowners.*

At **N.E. 151st Street** sight distance is difficult due to an existing fence and a horizontal curve the trail alignment makes in this area. Additionally, one homeowner just north of 151st Street currently drives along a portion of the trail between his/her driveway and the west-facing street. A second homeowner backs directly onto the trail upon leaving his/her driveway. To create safer crossing conditions for both, a new hammerhead/turnaround would be built within the trail right-of-way to the east, requiring a retaining wall within the trail right-of-way. The driveway to the north would be reconfigured so that drivers exiting the property could more directly access the crossing and the second homeowner would have room to turn around before exiting. Several utilities exist in this area and each would have to be inventoried with appropriate authorities. The length of the space between the two forks of the "Y" of this crossing would be striped, hinged tubular markers installed, overhead trail lighting provided, and appropriate signs erected. Wood guardrails on the east side would prevent drivers from pulling into the trail. (See Appendix 8, Intersection Improvements #2)

CAG comments:

- *Give oblique angles of approach.*
- *Trail users safest to yield*

- *A site for possible use of lights.*
- *Bottleneck occurs south of this crossing*
- *Can trail go west to minimize property impact*
- *Too expensive to move utilities?*
- *Open to both options*
- *Intersection should be level.*
- *One access drive preferable to two drives (4)*
- *This is my intersection. This is a complicated split intersection serving five residences. Conditions here are not easily understood by hired consultants. Proposed changes must be discussed with Peterson – Clayton – Tracy and Johnsons.*

Four residences south of this crossing on the east side have no vehicular access and delivery/service vans as well as emergency vehicles must use the trail to reach those homes. Homeowners must cross the trail to put out their recycle and garbage bins as well as to get to and from their garages. They are required to get King County Department of Parks and Recreation Special Use permits for any activity in the trail right-of-way. Steep and potentially unstable slopes to the west and property ownership issues to the east present constraints to trail widening in this area where the trail alignment has an extended horizontal curve.

For the crossing at **N.E. 147th Street/Edgewater Lane** two wide spots in the trail would be removed. Like other crossings, this would be provided with striping, hinged tubular markers, overhead lighting, appropriate signage, and would have necessary sight lines created by removing impeding vegetation. Where sight lines wouldn't be impaired, a six-foot high fence with vegetative screening would be provided on the east side of the trail. (See Appendix 8, Intersection Improvements #1)

CAG comments:

- *Drainage important – can federal grant be written to address drainage issues near N.E. 145th?*
- *Widen to west and engineer uphill solution*
- *Remove ivy from trees*
- *[South of this crossing] Area with bench within 100-foot right-of-way good for small park – remove fences (2)*
- *Take out jogs on either side of crossing*
- *Removing vegetation from sight lines is great!*
- *Limb up trees where possible and leave the trees*
- *Homes are buffered by Edgewater Lane in the neighborhood. Proposed changes should however be discussed with homeowners near affected crossing.*

Conclusion:

The original trail in the study area was built 30 years ago, before national standards for trail design and before serious consideration was given to issues such as the presence of wetlands or accessibility compliance. At its inception the trail's width was considered overly generous but the 10-foot width is now regarded as inadequate for the continually growing number of recreational users and commuting cyclists. In 30 years the trail's asphalt surface has deteriorated, invasive weeds and overgrown vegetation reduce the aesthetic experience, and trail crossings are points of potential conflict with trailside residents. Redevelopment is needed to bring the trail to meet current national design standards and to provide the public with a more pleasurable recreational experience. At the same time measures are needed to make it safer for everyone.

Because this section of the trail is part of a larger system it is important to insure consistency of design and safety standards along its length. Although it is owned by King County, Bothell, Kenmore, and Seattle also deal with the presence of the trail in their jurisdictions. All consider it an important bicycle-commuting route, as does the Washington State Department of Transportation. Because of the great number of users it is considered the major leg at intersections with minor streets and private driveways. Throughout its 27-mile length, where vehicular traffic crosses private driveways in residential, industrial or commercial zones, such cross traffic is required to yield to trail users, even to access restaurants, small shops, businesses, or garages. Where the trail crosses major roads, trail users are provided with appropriate traffic controls. Uniform treatment of crossings must be consistent throughout its length.

Primary constraints to widening the trail in the study area will be the narrow width of the existing bench between steep, unstable slopes on the uphill side in the southern section and streets/private property immediately east of the trail where numerous incursions into the trail right-of-way exist. Concerns of trailside homeowners must also be considered, such as screening and privacy. Very important will be further assessment of trailside ditches with regard to their potential functions and values as wetlands and as drains for upland (off-site) property owners. The next phase of work will require designers to look at a range of opportunities and constraints before a final alignment can be determined.

The intent of this cooperative effort between the City of Lake Forest Park and the County is to provide a public facility that meets the goals of the City's Comprehensive Plan as well as regulations in the City's Municipal Code. At the same time the County has a vision of uniform trails forming an integrated system for non-motorized circulation and this segment is a very important part of that regional vision. This trail serves a wide assortment of users and it is primarily in their interest that conditions must be improved. In order to obtain state and/or federal funding for trail improvements, nationally recognized standards will have to be met and thoughtful analysis will be needed to successfully redevelop this segment of the trail in an economically viable manner.

At this time even a preliminary estimate of construction costs is difficult. So many issues have yet to be determined that it will require greater knowledge of specific site conditions to determine resulting expenses. As more information becomes available potential figures can be drawn up. At this point a broad estimate is that the project could cost between \$3.5 and \$4 million. This number will be further refined during the schematic design, design development, and construction document phases of the work.

Bibliography

Accessibility Design for All, Washington State Regulations, 1998.

Burke-Gilman Trail: Final Environmental Impact Statement, City of Seattle, Department of Parks and Recreation, 1975.

Burke-Gilman Trail: Schematic Design Report, Edward MacLeod and Associates for City of Seattle, Department of Parks and Recreation, 1975.

Burke-Gilman Trail Supplement to the Environmental Impact Statement, King County, 1975.

Burke-Gilman Trail Vegetation Management Guidelines, (no author), 1999.

Evaluation of the Burke-Gilman Trail's Effect on Property Values and Crime, City of Seattle, Engineering Department, Office for Planning, 1987.

Guide for the Development of Bicycle Facilities, American Association of State Highway and Transportation Officials, 1999.

Initial Report of the Citizen's Advisory Committee Report Burlington-Northern Right-of-Way, supplemental documents, (no author) 1973.

Kenmore/Bothell Bikeway: A Proposed Bikeway Connection Between the Burke-Gilman and Sammamish River Trails, King County, 1979.

Lake Washington-Seattle North Trail a/k/a Burke-Gilman Trail, Final Environmental Impact Statement, King County, 1973.

Manual of Uniform Traffic Control Devices, U.S. Department of Transportation, Federal Highways Administration, 2003.

Regional Trail Inventory and Implementation Guidelines, King County Parks and Recreation Division, 2004.

Trails for the Twenty-First Century, Rails-to-Trails Conservancy, Island Press, 2001.

List of Appendices:

Appendix 1: **Right-of-Way Survey and Title Analysis**

Appendix 2: **Geotechnical Investigation**

Appendix 3: **Drainage Analysis**

Appendix 4: **Wetlands and Streams**

Appendix 5: **Wildlife Study**

Appendix 6: **Arborist Report**

Appendix 7: **Trail Crossing Plan**

Appendix 8: **Recommended Trail Crossings**